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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/885,332	06/20/2001	Batakrishna Mandal	1391-24800 DJK	3294

23505 7590 06/08/2005

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EXAMINER	
STEVENS, THOMAS H	
ART UNIT	**PAPER NUMBER**
2123	

DATE MAILED: 06/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/885,332	MANDAL, BATAKRISHNA	
	Examiner	Art Unit	
	Thomas H. Stevens	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 February 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8 and 10-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 10-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/24/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

ND

DETAIL ACTION

1. Claims 1-17 were previously examined.

2. Claim 9 was cancelled.

3. Claims 1-8,10-17 were examined.

Section I: Response to Applicant's Arguments (1st Office Action)

Drawings

4. Applicant is thanked for addressing these issues. Objections are withdrawn.

Information Disclosure Statement

5. Applicant is thanked for addressing these issues. Objections are withdrawn.

35 U.S.C.§ 112 (2nd)

6. Applicant is thanked for addressing these issues. In response to applicant's statements, rejections are withdrawn.

35 U.S.C.§ 103(a)

7. Applicant is thanked for addressing these issues. Applicant's arguments are persuasive; however, in an updated search new art was discovered in reference to amended independent claims.

Section II: Final Rejection (2nd Office Action)

Claim Rejections - 35 U.S.C. § 103

8. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1-8,10-17 are rejected under 35 U.S.C. 103(a) as being obvious by Chang (U.S. Patent 5,077,697 (1991)) in view of Parks et al. (U.S. Patent 4,562,557 (1985)) Chang teaches methods and apparatus for sonic borehole logging of formation shear using discrete frequency measurements (abstract); but doesn't teach the internal controller's ability to determine frequency and slowness (Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) from the receiver signals. Parks et al. teaches methods and apparatus for estimating parameters, such as slowness (Parks: columns 7 and 8,

lines 67-68 and 1-47, respectively) and attenuation of composite acoustic waves obtained in the course of sonic logging of formations traversed by a borehole (abstract).

At the time of invention it would have been obvious to one of ordinary skill in the art to modify Chang by way of Parks et al. to measure the correlation between waveform segments as a function of wave form locations, and particularly in the seismological field, frequency and phase analysis to detect speed and direction of propagation (Parks: column 2, lines 15-20).

Claim 1. An acoustic logging (Chang: column 2, lines 60-67) tool that comprises: an acoustic source configured to excite wave propagation in a quadrupole mode (Chang: column 3, lines 33-35); an array of acoustic receivers (Chang: column 4, lines 20-25); and an internal controller configured to record signals (Chang: column 6, lines 25-30) from each of the acoustic receivers and configured to process the signals to determine a shear wave propagation slowness (Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) for a formation surrounding the acoustic logging tool; wherein the internal controller is configured to determine a phase semblance as a function of frequency and slowness (Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) from the receiver signals.

Claim 2. The acoustic logging tool of claim 1, (Chang: column 2, lines 60-67; column 4, lines 20-25; column 6, lines 25-30; column 3, lines 33-35; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) wherein the acoustic source is a quadrupole source.

Claim 3. The acoustic logging tool of claim 2, (Chang: column 2, lines 60-67; column 4, lines 20-25; column 6, lines 25-30; column 3, lines 33-35; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) wherein the acoustic source includes four source elements (Chang: column 3, lines 55-60) that are equally spaced about the circumference of the logging tool, and wherein opposing elements are excited in-phase, and elements 90° apart are excited in inverse-phase (Chang: column 3, lines 32-43).

Claim 4. The acoustic logging tool of claim 3, (Chang: column 2, lines 60-67; column 4, lines 20-25; column 6, lines 25-30; column 3, lines 33-35; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) wherein each source element includes a piezoelectric transducer (Chang: column 3, lines 11-15 and 31-36).

Claim 5. The acoustic logging tool of claim 1, (Chang: column 2, lines 60-67; column 4, lines 20-25; column 6, lines 25-30; column 3, lines 33-35; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) wherein the array of acoustic receivers includes a set of four receiver elements at each of a plurality of positions along the longitudinal axis (Chang: column 3, lines 50-55) of the logging tool, wherein the receiver elements of each set are equally spaced about the circumference of the logging tool.

Claim 6. The acoustic logging tool of claim 5, (Chang: column 2, lines 60-67; column 4, lines 20-25; column 6, lines 25-30; column 3, lines 33-35; column 3, lines 50-55; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) wherein the acoustic source

includes four source elements that are equally spaced about the circumference of the logging tool, and wherein each of the source elements is aligned with a respective one of the receiver elements in each set of receiver elements (Chang: columns 12 and 13, lines 66-67 and 1-4, respectively).

Claim 7. The acoustic logging tool of claim 5, (Chang: column 2, lines 60-67; column 4, lines 20-25; column 6, lines 25-30; column 3, lines 33-35; column 3, lines 50-55; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) wherein the internal controller inverts signals (see claim interpretation) from two opposing receiver elements in each set of receiver elements and combines the inverted signals with signals from the remaining two receiver elements in the set of receiver elements to obtain a combined signal for each set of receiver elements.

Claim 8. The acoustic logging tool of claim 7, (Chang: column 2, lines 60-67; column 4, lines 20-25; column 6, lines 25-30; column 3, lines 33-35; column 3, lines 50-55; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) wherein each of the receiver elements includes a piezoelectric transducer (Chang: column 3, lines 11-15 and 31-36).

Claim 10. The acoustic logging tool of claim 9, (Chang: column 2, lines 60-67; column 4, lines 20-25; column 6, lines 25-30; column 3, lines 33-35; column 2, lines 25-41; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) wherein the internal controller is

configured to identify a phase semblance peak associated with each of a plurality of frequencies (Chang: column 6, lines 55-65) and wherein the internal controller is configured to identify a smallest slowness (Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) value associated with the phase semblance peak as the shear wave propagation (Chang: column 2, lines 25-41 slowness (Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) for the formation.

Claim 11. The acoustic logging tool of claim 1, (Chang: column 2, lines 60-67; column 4, lines 20-25; column 6, lines 25-30; column 3, lines 33-35; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) wherein the tool is configured for logging while drilling (Chang: column 9, lines 21-36).

Claim 12. The acoustic logging tool of claim 1, (Chang: column 2, lines 60-67; column 4, lines 20-25; column 6, lines 25-30; column 3, lines 33-35; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) wherein the source excites waves having frequencies greater than 2 kHz (Chang: column 12, lines 65-67).

Claim 13. A method of determining the shear wave propagation slowness (Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) of a formation (Chang: column 2, lines 21-41), the method comprising: exciting waves that propagate along a borehole in quadrupole mode (Chang: column 12, lines 30-56; column 13, lines 12-38); receiving acoustic signals at each of a plurality of positions along the borehole (Chang: column 6,

lines 25-27); and calculating, from the acoustic signals, slowness (Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) values associated with a peak phase (Chang: column 2, lines 50-58 with figure 3) semblance as a function of frequency.

Claim 14. The method of claim 13, (Chang: column 2, lines 21-41; column 12, lines 30-56; column 13, lines 12-38; column 6, lines 25-27; column 2, lines 50-58 with figure 3; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) wherein the peak phase semblance (Chang: column 6, lines 25-30) is associated with a borehole interface wave.

Claim 15. The method of claim 13, (Chang: column 2, lines 21-41; column 12, lines 30-56; column 13, lines 12-38; column 6, lines 25-27; column 2, lines 50-58 with figure 3; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) further comprising: determining a minimum slowness (Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) value associated (Chang: column 2, lines 32-35) with the peak phase semblance (Chang: column 6, lines 25-30).

Claim 16. The method of claim 15, (Chang: column 2, lines 21-41; column 12, lines 30-56; column 13, lines 12-38; column 6, lines 25-27; column 2, lines 50-58 with figure 3; column 2, lines 32-35; column 6, lines 25-30; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) further comprising: providing the minimum slowness (Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) value as an estimate of the shear wave propagation slowness (Parks: columns 7 and 8, lines 67-68 and 1-47, respectively).

Claim 17. The method of claim 13, (Chang: column 2, lines 21-41; column 2, lines 32-35; column 12, lines 30-56; column 13, lines 12-38; column 6, lines 25-27; column 2, lines 50-58 with figure 3; Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) further comprising: processing the acoustic signals to enhance the quadrupole response of a receiver array before said act of calculating slowness (Parks: columns 7 and 8, lines 67-68 and 1-47, respectively) values.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mr. Tom Stevens whose telephone number is 571-272-

3715, Monday-Friday (8:00 am- 4:30 pm) or contact Supervisor Mr. Kevin Teska at (571) 272-3716. Fax number is 571-273-3715.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100.

May 24, 2005

THS